Association, and the French Scientific Journals do not contain any regular announcements or reports of the meetings. The address of the President, General Sebert, before the Paris meeting is, however, published in several journals and the report of the Treasurer is printed in full in the *Revue Scientifique*.

M. Sebert reviewed the progress of mechanical science, and devoted the last third of his address to an international catalogue of scientific literature. It is rather curious that he does not in any way refer to the International Catalogue, but states that the problem is being solved by the Institut International de Biographie, established by MM. Lafontaine and Otlet in Brussels in 1895. The Dewey system of classification is adopted by them, and M. Sebert devotes a considerable part of his address to explaining the system which he advocates in warm terms.

The finances of the French Association are of interest. The capital amounts to 1,326,917 fr., chiefly due to legacies such as the American Association has never received. The income last year was about $17,000, of which nearly $7000 was income from the capital and about $10,000 represented the dues of members. These figures apparently are much more favorable than those of the American Association, in which the income from permanent funds was last year $233 and receipts from members $6216. It appears, however, that, owing to the cost of the volume of proceedings and of administration, the expenses of the French Association are considerably larger than the receipts from the annual dues of members, whereas, during the past two years, the American Association has been able to transfer to the permanent funds a portion of the dues received from members.

Although about half of the interest on the capital is used for current expenses, there is still a considerable sum—about $3000—which is annually awarded for the promotion of research. Among the larger grants made last year were: $300 to M. Giard for the publication of papers from the laboratory at Wimereux; $300 to M. Deniker for the publication of his book on the races of Europe; $240 to M. Lacaze-Duthiers towards repairing the steamboat of the zoological laboratory at Arago, and $200 to M. Turpain for researches in telegraphy by Hertzian waves.

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*THE ELECTRICAL EFFECTS OF LIGHT UPON GREEN LEAVES.**

IN the preliminary communication recently made to the Royal Society, the author shows how, from the study of the electrical effects of light upon the retina, he was led to ask whether the chemical changes aroused by the action of light upon green leaves are also accompanied by electrical effects demonstrable in the same way as the eye currents. The question is tested in the following way: A young leaf freshly gathered is laid upon a glass plate and connected with a galvanometer by means of two unpolarizable clay electrodes A and B. The half of the leaf connected with A is shaded by a piece of black paper. An inverted glass jar forms a moist chamber to leaf and electrodes, which are then enclosed in a box provided with a shuttered aperture through which light can be directed. A water trough in the path of the light serves to cut out heat more or less. Under favorable conditions there is obtained with such an arrangement a true electrical response to light, consisting in the establishment of a potential difference between illuminated and non-illuminated half of a leaf, amounting to 0.02 volt.

The deflection of the galvanometer spot during illumination is such as to indicate current in the leaf from excited to protected part. The deflection begins and ends sharply with the beginning and end of illumination; it is provoked slightly by diffuse daylight, more by an electric arc-light, most by bright sunlight. It is abolished by boiling the leaf, and by the action of an anæsthetic, carbon dioxide.

The first experiments, made at the end of March, were upon iris leaves taken from plants about six inches high, and the response to light was then between 0.001 and 0.002 volt in value. Experiments upon similar leaves were resumed early in May, when it appeared that the external condition in which the state of the leaf is

* Abstract of a paper presented before the Royal Society by Augustus D. Waller, M.D., F.R.S., and published in *Nature*.

most obviously governed is *temperature*. On warm days the response ranged from 0.005 to 0.02 volt; on cold days it did not rise above 0.005, and was sometimes *nil*. Some tests upon leaves in a warmed box gave satisfactory results, which may thus be summed up: The normal response at 15°–20° C. is diminished or abolished at low temperature (10°) augmented at high temperature (30°), diminished at higher temperature (50°), and abolished by boiling.

As the month of May advanced, the iris leaves, even in the warm box, became more and more inert, and by the 23d inst., when the plants were mostly full grown and in flower, no satisfactory leaf could be found. Leaves of iris appear to give more marked response at or about mid-day, than at or about 6 p. m. Tested by Sach's method the leaves give no evidence of starch activity during isolation.

On the failure of the iris leaves to react, other leaves were sought for which should give evident differences of reaction in correlation with evident differences of state. Leaves of tropæolum and of mathiola gave a response to light contrary in the main to the ordinary iris response, viz, 'positive' during illumination, and subsequently 'negative.' In these two cases leaves empty of starch acted better than leaves laden with starch. Leaves of begonia gave a variety of responses strongly suggestive of the simultaneous action of two opposed forces effecting a resultant deflection in a + or — direction. Leaves of ordinary garden shrubs and trees, etc., *e. g.*, lilac, pear, almond, mulberry, vine, ivy, gave no distinct response; this is possibly due to a lower average metabolism in such leaves as compared with the activity of leaves of small young plants in which leaf-functions are presumably concentrated within a smaller area. The petals of flowers gave no distinct response, which indicates that chloroplasts are essential to the reaction.

The effect of carbon dioxide upon the iris leaf was abolition of response during and after passage of the gas, with subsequent augmentation. Upon mathiola and trapæolum, augmentation of response followed on applying air containing 1 to 3 per 100 of carbon dioxide, and prompt abolition resulted from a full stream run through the leaf-chamber. On the air supply being kept clear of carbon dioxide there was gradual abolition of response, followed by gradual recovery on the re-admission of a small amount of carbon dioxide.

'Fatigue' effects may be produced if the successive illuminations (of five minutes duration) are repeated at short intervals (10 minutes). At intervals of one hour, successive illuminations of five minutes produce approximately equal effects. With the leaf of mathiola, periods of illumination of two minutes at intervals of 15 minutes were used without provoking any obvious sign of fatigue.

SCIENCE RESEARCH SCHOLARSHIPS.

THE Commissioners for the Exhibition of 1851, as we learn from the London *Times*, have made the following appointments to Science Research Scholarships for the year 1900 on the recommendation of the authorities of the respective universities and colleges. The scholarships are of the value of £150 a year, and are ordinarily tenable for two years (subject to a satisfactory report at the end of the first year) in any university at home or abroad, or in some other institution approved of by the Commissioners. The scholars are to devote themselves exclusively to study and research in some branch of science, the extension of which is important to the industries of the country. A limited number of the scholarships are renewed for a third year where it appears that the renewal is likely to result in work of scientific importance.

Nominating Institution.	Scholar.
University of Edinburgh . .	Charles E. Fawsitt, B.Sc.
University of Glasgow.....	Vincent J. Blyth, M.A.
University of Aberdeen.....	James Moir, M.A., B.Sc.
Yorkshire College, Leeds...	William M. Varley, B.Sc.
University Coll., Liverpool..	John C. W. Humfrey, B.Sc.
University College, London	Samuel Smiles, B.Sc.
Owens College, Manchester.	Norman Smith, B.Sc.
Univ. Coll., Nottingham....	Lorenzo L. Lloyd.
Univ. Coll. of South Wales and Monmouthshire, Cardiff.....	Alice L. Embleton, B.Sc.
Royal Coll. Science, Dublin.	John A. Cunningham, B.A.
Queen's College, Galway....	William S. Mills, B.A.
University of Toronto.....	John Patterson, B.A.
Queens University, Kingston, Ontario.....	William C. Baker, A.M.
Dalhousie University, Halifax, Nova Scotia.....	James Barnes, M.A.
University of Sydney.....	John J. E. Durack, B.A.

The following scholarships granted in 1898 and 1899 have been continued for a second year